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OF

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ON BEHALF OF

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STATEMENT OF QUALIFICATIONS

My Name is Roger Sherman. I am Brown-Forman Professor of Economics at the University of Virginia. I was awarded the M.B.A. degree by Harvard University and the M.S. and Ph.D. degrees by Carnegie-Mellon University. I have been at the University of Virginia since 1965 and served as Economics Department chair from 1982 to 1990. I have published five books, including an edited volume on postal issues, and over 80 articles, including 10 that can be related to postal matters. I currently serve on the editorial boards of two academic journals, including the Journal of Regulatory Economics. In the past I have served as consultant to the U.S. Postal Service and the Postal Rate Commission. My curriculum vitae is attached as Appendix A.

I. PURPOSE OF TESTIMONY

The purpose of my testimony is to review theoretical foundations of the Postal Service pricing proposals in Docket R97-1. Approaches to estimating Ramsey prices will be examined. The economic welfare advantages of Ramsey prices over the prices proposed by the Postal Service will be identified and estimated, and the role of Ramsey pricing for workshare discounts will be discussed. Costing principles will be discussed briefly. The newly proposed forms of reply mail will also be examined.

II. RAMSEY PRICING

A. Introduction

Ramsey prices will be described briefly here, and then the data needed to estimate them will be noted. Welfare measures will be illustrated and a summary of Ramsey prices and their effects will be presented and compared with Postal Service proposals in Docket No. R97-1 at the level of the major mail classes. Part B explores Ramsey prices in more detail by defining various degrees of Ramsey pricing, depending on the different constraints that may be imposed, and by presenting prices and their effects for the main subclasses of mail and comparing them with Postal Service proposals. Part C presents welfare effects of Ramsey prices compared with rates proposed by the Postal Service in Docket R97-1. And Part D considers worksharing discounts.

1. The Idea of Ramsey Prices

If the Postal Service were to set prices for all mail service subclasses at their marginal costs (represented, say, by accurate volume variable costs), the outcome would be efficient, in that consumers could decide their usage of mail services based on the true marginal costs of those services. But a large deficit would result, because revenues would not be sufficient to cover fixed and other costs that are not counted as volume variable. Such a deficit can be avoided by pricing above marginal cost, but doing so will cause welfare losses. Pieces of mail that would benefit consumers if prices

were at marginal costs will no longer be sent at higher prices, and that causes welfare losses. The remarkable property of Ramsey prices is that they minimize the resulting welfare losses.

Pricing above marginal cost is preferred on fairness grounds to pricing at volume variable costs and meeting the consequent deficit out of general tax revenues. The latter course would not be perfectly efficient because general tax revenues are raised in ways that impose some welfare losses. General tax revenues could be a more efficient source than pricing postal services considerably above their marginal costs, though, because the welfare losses can be lower when spread over many goods. The main objection to such a course, however, is that taxes to cover the postal deficit may fall partly on those who do not use the Postal Service, which is unfair. Requiring that users of postal services pay all their costs avoids such an unfair outcome. Forbidding cross subsidy accomplishes the same end by preventing one group from paying for another group's consumption.

Ramsey prices depend on costs and demand elasticities. If cross elasticities of demand are zero, as is true for most subclasses of mail, the Ramsey price takes an especially simple form,

(1)

$$\frac{P_i - MC_i}{P_i} = -\frac{k}{E_{ii}}$$

where P_i is price for the ith service, MC_i is marginal cost, E_{ii} is own price elasticity of demand, and k is a constant between zero and one. Because the ratio, price minus marginal cost over price, is inversely related to demand elasticity, this pricing formula is often called the inverse elasticity rule. The more general formula for the jth service is

(2)

$$\Sigma_i (P_i - MC_i) \frac{E_{ji}}{P_i} = -k$$

where E_{ji} is the cross-price elasticity, showing the effect on volume j of a change in price i. One term in the summation over all i on the left side of equation (2), the case where i = j, will be equivalent to equation (1). And the other terms will disappear when crosselasticities are zero, reducing equation (2) to equation (1).

2. Variables and Data

From a given starting point, the costs and demand functions estimated by the Postal Service can be used to estimate Ramsey prices, and such prices are presented by Witness Bernstein (USPS-T-31). I shall also present Ramsey price estimates, using the same starting point as briefly noted in section 2.1. While using the same long-run elasticities in Ramsey price formulas as Witness Bernstein, I differ by using long-run elasticities in forecasting volume responses, which affects the contribution that will be

raised to cover other costs. Witness Bernstein used short-run elasticities in those volume forecasts, consistent with the Postal Service plan, which focuses on the test year. As explained below in section 2.2, the approach I use is more conservative, in that volumes will tend to be lower with the long-run elasticities, but that is what should be expected over the longer life of the proposed postal prices. The Ramsey prices I estimate are not very different from Witness Bernstein's, and I join him in praising such prices for their welfare effects. I also illustrate them in some additional ways, such as comparing them and their welfare effects with the Postal Service pricing proposals in R97-1.

2.1. Costs, Prices, Volumes and Demand Functions

To estimate Ramsey prices requires information on costs, demands, and demand elasticities. The costs of mail services are taken from the record in the case; they are summarized by Witness Bernstein (USPS-T-31, p. 55). I accept the logarithmic form of demand function used in Postal Service estimates of demand (Witness Thress, USPS-T-7, and Witness Musgrave, USPS-T-8). As a starting point for that function, I use the before-rates record of rates and quantities in Witness Bernstein's Testimony (USPS-T-31, p. 4 and p. 40). This initial reference point fixes the functions numerically. Then effects on volumes of any changes, say in prices, can be estimated from that starting point. Data and procedures are described in OCA-LR-5. One variable that requires some discussion is demand elasticity.

2.2. Demand Elasticities: Long-Run or Short-Run?

In making comparisons between Postal Service proposals and Ramsey prices, a choice of demand elasticities must be made. Postal Service Witness Bernstein, who provides Ramsey price estimates for the Postal Service (USPS-T-31), based the prices on long-run demand elasticities but used short-run rather than long-run elasticities in creating volume estimates. Ramsey pricing formulas would appear to be properly based on long-run elasticities, which should yield correct prices for the period over which the prices are to be effective. Using short-run elasticities in volume estimates will take account of the gradual adjustment of volume to a change in price so the test-year volume can be forecast, and test-year results can be predicted. Each short-run demand elasticity is a weighted average of the gradually increasing quarterly responses to a price change. For any set of new rates, these short-run elasticities yield volumes comparable to those forecast for proposed Postal Service rates in the test year, on the assumption that the new rates will take effect on January 1 (USPS-T-31, p.42-44).

As one should expect, the short-run response to price change tends to be less strong than a long-run response will be. Short-run elasticities will ordinarily be smaller in absolute value (at least not larger) than long-run elasticities, because they allow less time for consumers to adjust to the new prices. So volume forecasts for price increases based on short-run elasticities will be greater than those based on long-run elasticities. Thus, using the long-run elasticities will tend to forecast smaller volumes than use of short-run elasticities would, and that will make it harder to raise money as contribution

to costs other than volume variable costs. Notice that the use of long-run elasticities to forecast mail volumes is more conservative than forecasting for the test year alone, because over the longer-run time period volumes can be expected to shrink slightly.

Now, even if long-run elasticities are applied to Ramsey pricing formulas, those Ramsey prices will be affected by the use of short-run elasticities in volume forecasts. The reason is that volumes will differ when long-run rather than short-run elasticities are used in forecasting them, so contributions will be affected. Since a target level of contributions is to be raised by proposed prices, differences in forecast volumes will cause differences in Ramsey (or other) prices. As it turns out, these differences are not great.

What elasticity is best to apply depends on the time period the application will be in effect. Since the Postal Service prices that are adopted can be expected to be in place beyond the period of the test year, the use of a longer-run elasticity is advisable. In order to consider the long run situation, after full adjustment to any new prices, long-run elasticities are needed, both in the Ramsey price formulas and in forecasting volumes to go with those prices. Long-run elasticities are provided by Witness Thress (USPS-T-7) and Witness Musgrave (USPS-T-8) and summarized by Witness Bernstein (USPS-T-31).

In carrying out estimates on this long-run basis, comparability with the Postal Service proposal is not easily maintained. The reason is that, generally, higher prices will be needed when the greater (in absolute value) long-run elasticties are used, in order to raise the same level of contribution. Not wanting to alter the Postal Service

price proposals, however, I shall keep the proposed rates the same, but will accept as a reference point the lower contribution that results from their use with volume forecasts that rely on long-run rather than short-run demand elasticities. The contribution obtained in this way from proposed test-year prices will be raised also from Ramsey prices, so comparisons between prices are possible.

3. Welfare Measurement

If postal prices were set equal to marginal (volume variable) costs, the Postal Service would not cover all of its costs, which by statute (39 U.S.C. Š 3622(b)) it is required to do. To prevent a deficit, postal prices must exceed average volume variable costs. Indeed, they are supposed to raise enough revenue to cover all costs. The idea of covering all costs, as required by statute, derives from fairness considerations, as noted above. Ensuring that those who use postal services pay all their costs saves nonusers from having to help pay for a postal deficit they did not create. But there are losses in economic welfare when prices exceed marginal costs. The advantage of Ramsey prices is that they minimize such welfare losses.

Let us briefly restate and illustrate the welfare loss from pricing above marginal cost. In Figure 1, the welfare maximizing price would equal marginal cost at point A, where marginal consumers value the service at exactly what it costs. Figure 1 also shows the contribution that can be obtained by raising the price of a service above its marginal cost. The rectangular area identified as "contribution" ((P-MC) V_P) represents both lost consumer surplus, in that consumers must pay P-MC more for each of the V_P

units they continue to consume, and the contribution obtained from the consumers which can be used to cover fixed costs. Since covering costs is a benefit, and the contribution for that purpose equals lost consumer surplus, these two amounts offset each other. But there remains the shaded area ABC in Figure 1 that would be consumer surplus if price equaled marginal cost; it is lost when price is raised to P, because those units V_{MC}-V_P simply are not consumed at the higher price, P. Although it would only cost MC to provide a unit of service, the consumers are asked to pay P, so the consumer at B now values the service at the level of P. When price is raised to P, a range of possible consumption from A to B is lost. In the volume range from V_P to V_{MC}, consumers value the service more than it actually costs but less than they are asked to pay. The shaded area, ABC, represents the consumer surplus that is lost when price is raised to P and consumers no longer consume the volume V_{MC}-V_P. That area ABC represents the net welfare loss of raising price above marginal cost in order to cover fixed costs.

The welfare loss can be estimated easily when demands are known and are linear. Suppose demand is V = a-bP. When price is raised above marginal cost the triangular welfare loss in Figure 1 (area ABC) is approximated by the price-minus-marginal-cost difference times the quantity difference times one half (from the rule for

calculating a triangular area: one half the base times the height). Substituting from the demand function, this welfare loss can be put in the form:

(3)

$$(P- MC)(V_{MC} - V_P)\frac{1}{2} = (P- MC)(a- bMC- (a- bP))\frac{1}{2} = (P- MC)^2\frac{b}{2}$$

Recall that V_{MC} represents volume at marginal cost prices and V_P represents volume at prices P Notice that welfare loss varies with the square of the difference between price and marginal cost.

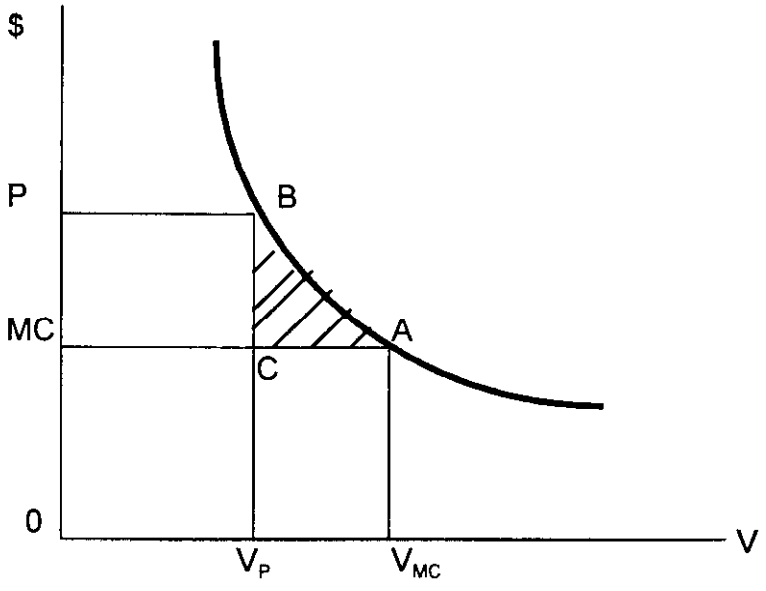

FIGURE 1

Equation (3) above indicates that large differences between price and marginal cost are to be avoided, if possible, because the welfare loss rises with the square of the price difference. On the other hand, the purpose of the rise in price is to make a contribution to fixed cost, so a greater contribution should justify a greater difference between price and marginal cost. Ramsey prices balance these two considerations, making the marginal welfare loss per unit of marginal contribution equal across all services.

Other considerations can warrant departures from the Ramsey prices that keep welfare losses small. But departures from Ramsey prices should consider the consequences they have for welfare loss, which is essentially the cost of departing from Ramsey prices.

4. Summary of Estimated Ramsey Prices

We begin with a summary that focuses on five major classes of mail. Table 1 presents average revenue per piece for the major mail classes as proposed by the Postal Service (TY98 After Rates) and as they might be with Ramsey prices at this aggregative level. The Ramsey prices represented here take into account the RFRA, which imposes prices on so-called preferred services, and they comply with incremental cost tests that avoid cross subsidy. Levels of contribution to other costs that are obtained from each mail class are also reported in Table 1. Notice that the total contribution is the same under both sets of prices.

Table 1 shows that, relative to Ramsey prices, the proposed Postal Service TY98 AR rates raise little contribution to other costs from Periodicals mail or from Special Services, and they raise less revenue from Standard B Mail. Postal Service rate proposals draw a larger contribution than Ramsey prices from Standard A Mail, and they draw substantially greater contribution from First Class Mail, which includes Priority Mail, and from Express Mail. Table 2 reports estimated welfare losses for the classes, and relates those losses to their contribution burdens. Whenever a price is raised above marginal cost in order to raise money as contribution to support other costs, a welfare loss results. At the higher price there is a loss in consumer surplus that equals the product of the price-minus-marginal-cost difference times the volume at that higher price. This product is not counted as a loss because it is offset by an exactly equal contribution to other costs that is raised by the higher price. But, at the higher price, there is a welfare loss that is not offset by contribution. Consumption is reduced by the difference between volume at the marginal-cost price and volume at the higher price. The area below the demand curve and above the marginal cost curve over that lost volume range represents the welfare loss, which would have been consumer surplus but for the price increase.

Table 1. AVERAGE REVENUE AND CONTRIBUTION

Mail Class	Ramsey Average Revenue	TY98 AR Average Revenue	Ramsey Contribution ($millions)	TY98 AR Contribution ($millions)
First	.352	.380	16,365	19,372
Express	11.342	13.412	298	419
Periodicals	.601	.207	3,441	118
Standard A	.146	.172	4431	5321
Standard B	1.587	1.663	358	288
Special	2.563	1.556	923	298
Total	--	--	25,816	25,816

Table 2. WELFARE LOSS RELATIVE TO CONTRIBUTION

Mail Class	Ramsey Welfare Loss ($millions)	TY98 AR Welfare Loss ($millions)	Ramsey Advantage ($millions)	Ramsey Loss per Contribution	TY98 AR Loss per Contribution
First	1,176	1,982	808	0.072	0.101
Express	152	300	148	0.512	0.714
Periodicals	264	1	-263	0.077	0.007
Standard A	393	839	446	0.089	0.158
Standard B	25	18	-7	0.069	0.063
Special	83	19	-64	0.090	0.065
Total/Avg.	2,094	3,159	1,065	0.081	0.122

Relative to Ramsey prices, the proposed Postal Service rates cause very little welfare loss in Periodicals and a relatively small loss in Special Services, but they impose greater welfare losses in First Class, Standard A, and Express Mail. And the overall welfare loss is greater under the Postal Service's proposed rates than under Ramsey prices by more than $1 billion, as the last entry in the middle (Ramsey Advantage) column of Table 2 shows. Thus, the low welfare losses from proposed prices in Periodicals, Standard B Mail, and Special Services, are more than offset by large welfare losses in First Class Mail, Express Mail, and Standard A Mail.

Welfare loss per dollar of contribution also is shown by mail class for each set of rates in Table 2. The average welfare loss per dollar of contribution is fairly constant across mail classes under Ramsey prices (at the margin they should be equal to minimize welfare loss, but average values here may not be equal, and besides, they are affected by constraints on prices for preferred classes and to avoid cross subsidy), ranging from 0.069 to 0.090 over classes with modest constraints and up to 0.512 for Express Mail where rates substantially above Ramsey rates are needed to cover incremental cost. The loss per contribution varies much more across mail classes under the Postal Service proposal, from a low of 0.007 to a high of 0.158 in classes with modest constraints and 0.714 in Express Mail, where the Postal Service rate is higher than the incremental cost test requires. Whenever the ratio of welfare loss incurred per unit of contribution to other costs is much greater in some mail classes than others, the

overall welfare loss will be greater. The overall welfare loss is 12 cents per dollar of contribution under the Postal Service's proposed rates, but only 8 cents per dollar of contribution under the constrained Ramsey prices.

These observations are not necessarily criticisms of the Postal Service rate proposals in R97-1. The Postal Service must serve goals beyond economic efficiency. Some of those other goals are incorporated in Ramsey prices as well as in Postal Service proposals, though, through constraints on markups for preferred mail classes and the requirement to cover incremental costs. These constraints affect 8 of the 21 subclasses of mail that are considered. The aim here is to provide an overview of the Postal Service rate proposal compared with Ramsey prices and to introduce some terms that will be explained and used in what follows. We now turn to compare the pricing proposals with Ramsey prices across the major subclasses.

B. Ramsey Prices by Subclass of Mail

Witness Bernstein (USPS-T-31) showed advantages of Ramsey pricing through a comparison of estimated Ramsey prices with reference prices from R94-1. He showed that roughly $1 billion more in consumer benefit would be available from the Ramsey prices he presented. Further analysis of Ramsey pricing will be presented here, to add detailed considerations and to allow a fuller evaluation of their advantages by subclass relative to Postal Service proposals in this case. For consistency, an effort is made to use the same data as those used by Witness Bernstein, and variations in method will be noted.

The comparison Witness Bernstein presents of Ramsey prices with R94-1 markups, while of interest, has little connection to the current Postal Service proposal. In responding to Interrogatories (OCA/USPS-T-31-5, Summary Table 1; NAA/USPS-T31-13, Summary Table 1A; DMA/USPS-T31-2, Table 13A), Witness Bernstein provided comparisons of Ramsey prices with the prices proposed by the Postal Service in R97-1, but did not provide a complete welfare analysis of the proposed rates. The aim here is to present Ramsey prices and compare them and their effects with the prices proposed by the Postal Service in this case.

1. Degrees of Ramsey Pricing

Witness Bernstein presented modified Ramsey prices, adjusted for requirements of the Revenue Forgone Reform Act ("RFRA"), incremental cost limits, and some judgmental factors. Indeed, of the 21 mail subclasses for which Ramsey prices were presented, the prices were modified away from Ramsey prices for 11 of the subclasses, leaving only 10 prices to be based on Ramsey principles. Ramsey prices will be presented here in four phases, to show effects of pricing modifications. The calculations are described in OCA-LR-5. To begin, there are pure, unadulterated, Ramsey prices that take no other consideration into account. These pure Ramsey prices are useful as a reference point. They do not comply with the RFRA, nor do they pass cross-subsidy tests. We consider adjustments to these benchmark prices in turn. The pure Ramsey prices that serve as a reference point are shown in column (1) of Table 3.

The first modifications will reflect requirements of the RFRA, which prescribes markups for six preferred classes of mail. Three Periodicals subclasses, In-County, Nonprofit, and Classroom, are to have a markup equal to one-half the markup on Periodicals Regular mail. Standard A Nonprofit and Nonprofit Enhanced Carrier Route mail are to have markups equal to one-half the markups of the corresponding members of their subclass, Standard A Regular and Enhanced Carrier Route. And Standard B Library Rate is to have a markup equal to one-half the markup of Standard B Special Rate. Modified Ramsey prices that reflect these mandated markup requirements appear in column (2) of Table 3, identified by PFD in the column heading and marked by asterisks where prices are affected.

Second, since it is possible for a Ramsey price to lie below the average incremental cost of a service subclass, tests for that possibility are appropriate. The logic is compelling: If the price is below average incremental cost for any subclass, eliminating that subclass would benefit other mail service users. The cost saved (total incremental cost) by eliminating the service would exceed the revenue that had been raised, which means that the service was being subsidized by other services. To avoid such cross subsidy, the price of each service should be set to cover the incremental cost of that service. The Ramsey prices for Express Mail and Registry are below their average incremental costs, and modified prices are introduced for those services in order to avoid cross subsidy. Modified Ramsey prices that take into account both the RFRA and these incremental cost requirements are shown in column (3) of Table 3,

denoted IC + PFD in the column heading and marked by asterisks. These constrained Ramsey prices were used for comparisons by major mail class in Tables 1 and 2 of Part A.

Third, at this point some Ramsey prices are quite high. To avoid high prices, Witness Bernstein imposed a judgmental limit on markups, requiring that no markup exceed the First Class letter markup by more than 10 percent. This is quite restrictive, for if the same limitation was applied to the Postal Service proposal, the price for Standard A Enhanced Carrier Route Mail would have to be lowered. This markup limitation affects the Ramsey prices of Regular Periodical mail (and, since they depend on it through the RFRA, three preferred subclasses of Periodicals mail) and the prices of two special services, Insurance and COD Mail. Prices that also take these additional constraints (denoted TH for too high) into account appear in column (4) of Table 3 and are marked by asterisks. Finally, column (5) of Table 3 contains average revenues for the Postal Service price proposals in R97-1.

In moving from pure Ramsey prices to the constrained Ramsey prices that benefit preferred classes in column (2), only two subclasses of mail are actually favored: Standard A Nonprofit and Standard A Nonprofit Enhanced Carrier Route, but these prices are cut by more than 50 percent. Given a Ramsey price regime, the other four preferred classes would have lower prices than those dictated by the RFRA. Two subclasses are penalized by the incremental cost tests reflected in column (3): Express Mail and Registry. And three subclasses have prices reduced by Witness Bernstein's

judgmental constraint on markups that are shown in column (4): Periodicals Regular, Insurance, and COD.

Table 3. Average Revenue

Mail Subclass	Pure Ramsey (1)	Ramsey PFD (2)	Ramsey IC+PFD (3)	Ramsey IC +PFD+TH (4)	TY98 AR Proposed (5)
Letters	$0.3251	$0.3373	$0.3361	$0.3556	$0.3518
Cards	$0.1361	$0.1376	$0.1374	$0.1397	$0.1972
Priority	$2.2377	$2.2536	$2.2520	$2.2759	$3.7770
Express	$7.3560	$7.3926	$11.3421*	$11.3421	$13.4120
PerInCo	$0.1102	$0.1941*	$0.1928	$0.1416	$0.0928
PerNP	$0.2651	$0.3303*	$0.3281	$0.2409	$0.1585
PerClssrm	$0.2936	$0.5798*	$0.5759	$0.4229	$02168
PerReg	$0.6681	$0.7299	$0.7235	$0.4724*	$0.2363
StdA Reg	$0.2439	$0.2511	$0.2504	$0.2619	$0.2132
StdA ECR	$0.0795	$0.0802	$0.0801	$0.0811	$0.1500
StdA NP	$0.3654	$0.1475*	$0.1472	$0.1515	$0.1281
StdA NP ECR	$0.1710	$0.0554*	$0.0554	$0.0557	$0.0783
StdB Parcel	$3.9450	$3.9781	$3.9750	$4.0248	$3.3364
StdB BPM	$0.8288	$0.8430	$0.8416	$0.8633	$0.9128
StdB Spl	$1.7496	$1.7764	$1.7738	$1.8148	$1.7572
StdB Lib	$2.0163	$2.0376*	$2.0359	$2.0631	$1.8249
Registry	$6.7158	$6.8018	$8.4147*	$8.4147	$8.5808
Insurance	$16.0121	$29.1786	$27.0467	$2.9067*	$2.4331
Certified	$1.6890	$1.7252	$1.7216	$1.7778	$1.4993
COD	$9.2313	$9.6825	$9.6374	$9.3372*	$4.6381
Money Ord	$0.9693	$1.001	$09983	$0.8525	$1.0136

To make up for lost revenue in moving from Ramsey prices to lower rates for the preferred classes, other rates must be raised. For example, the First Class letter rate has to increase by slightly more than 1 cent per piece. Incremental cost tests raise two prices and allow slight reductions in others. The judgmental markup limitations in column (4) cause the greatest loss in revenue, and they require the First Class letter rate to increase by roughly 2 more cents. One reason these latter limitations are so costly is that lowering the Periodicals Regular markup affects also the prices of three preferred classes that have their markups tied to it. Thus, departures from pure Ramsey prices have important effects, such as causing the letter mail price to be 3 cents higher than the pure Ramsey prices would produce.

For First Class Mail, Postal Service rate proposals are higher than even the most constrained Ramsey prices. In letters, the proposed average rate is 1.6 cents higher than the Ramsey price in column (3) that reflects RFRA dictates and incremental cost tests against cross subsidy, although the proposed rate is 0.4 cents lower than the Ramsey price in column (4) that reflects Witness Bernstein's markup limitation. The Postal Service proposal is 41 percent higher than the most constrained Ramsey price for cards, and 66 percent higher than the most constrained Ramsey price for Priority mail. In Express Mail, the proposed price is 18 percent higher than the most constrained Ramsey price, which meets the incremental cost test.

In the Periodicals Mail Class, rates proposed by the Postal Service are very low, roughly two-thirds to one-half of the constrained Ramsey prices. The proposed rates

for Periodicals Classroom are even below some estimates of volume variable costs (Witness Kaneer, USPS-T-35). The crucial rate here is that for Periodicals Regular, because other markups are tied to that subclass's markup through the RFRA. The Postal Service's proposed rate for that subclass is one half the most constrained Ramsey rate. Half the subclasses in Standard A Mail are also subject to the RFRA. One of the unconstrained Standard A subclasses, Standard A Regular, has a lower price proposed than the constrained Ramsey price, while the other, Standard A Enhanced Carrier Route, has a price almost twice as high as its constrained Ramsey counterpart. The two preferred Nonprofit subclasses that are set by terms of the RFRA reflect these price differences.

Overall, the Standard B rates and Special Services rates proposed by Postal Service tend to be lower than constrained Ramsey prices. The Standard B Parcel Post rate is about 17 percent lower than the most constrained Ramsey price. The proposed rate for Bound Printed Matter is higher than the constrained Ramsey price, while the Special Rate, and thus by the RFRA the Library Rate, is lower. In Special Services, proposed rates are higher for Registry and Money Order, but lower in all other cases, up to, in the case of COD, roughly half. Thus, the proposed rates differ considerably from the Ramsey prices that have been constrained in eleven of the 21 subclasses being studied.

2. Representing Welfare Losses

Witness Bernstein made welfare comparisons between his modified Ramsey prices and R94-1 reference prices. A drawback of this procedure is that any estimated advantage of Ramsey prices will depend on the reference point that is chosen. A more complete analysis would estimate the entire welfare loss for each set of prices, relative to the ideal welfare benchmark of marginal cost prices (prices which cause no welfare loss). Then, with such a measure of total welfare less, it would be possible to evaluate the welfare loss for each subclass relative to the contribution raised from that subclass.

The comparison with other prices advanced by Witness Bernstein offers an advantage. Because they involve differences in prices that are not great, the welfare loss approximations from the comparison may be reasonably accurate. These approximations arise from using triangular representations of welfare loss, as shown above in Figure 1, which assume the demand curve is linear, when the demand curve actually is not linear. The linear approximation to a curve is of course better over short distances, as between prices that are not very far apart. Comparing any set of prices that will cover all fixed costs with marginal cost prices will involve large price differences, which may lead to poorer welfare loss approximations.

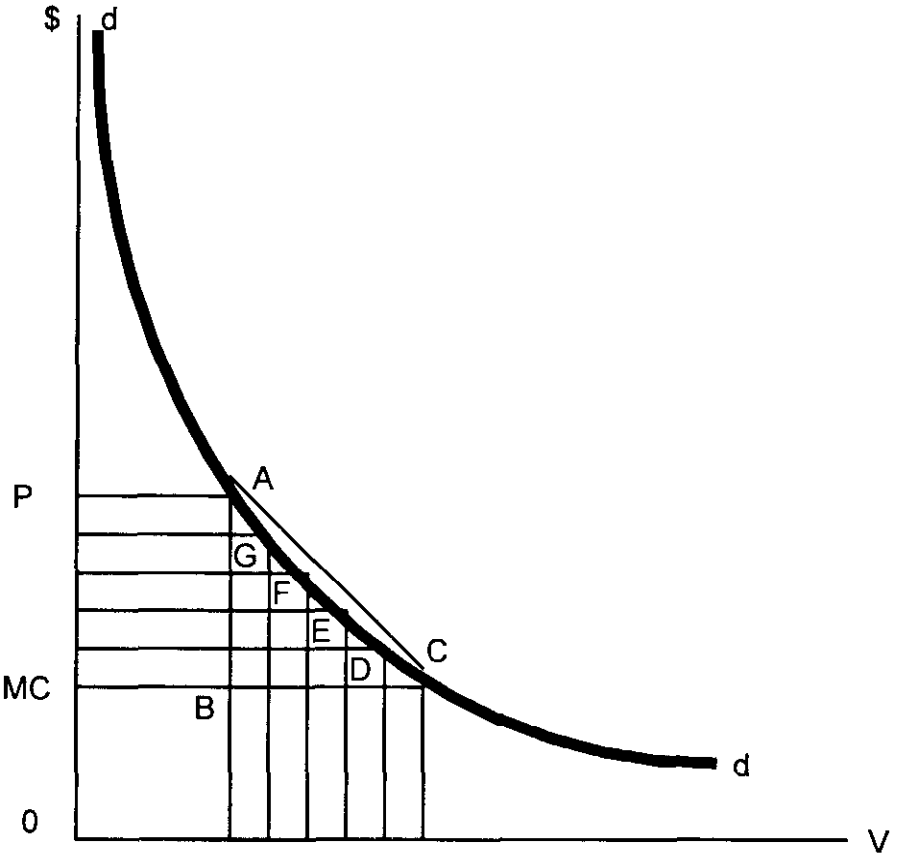

Figure 2

The simple linear approximation to demand will tend to overstate the welfare loss from a price above marginal cost. Figure 2 shows a nonlinear demand curve, dd, of the type actually estimated for the subclasses of mail. A linear approximation to the welfare loss from pricing at marginal cost is represented by the area ABC. What is wanted is the area under the demand curve and above marginal cost between B and C, because the demand curve represents consumers' valuation of the service and the difference between that and marginal cost is potential consumer surplus. That potential consumer

surplus is lost when price exceeds marginal cost. It should be clear from Figure 2 that the area under the demand curve is smaller than area ABC.

It is possible to limit the error from linear approximation, however, by estimating the welfare loss in parts. In Figure 2, the difference between P and MC has been divided into five equal parts. The point where each of these imagined intermediate prices meets the demand curve is labeled with letters, D, E, F, G. Now if linear approximations are made for each of the resulting five demand segments, along line segments CD, DE, EF, FG, and GA, and areas under these five segments down to marginal cost are measured (rather than ABC), the resulting error will be much smaller, as inspection of Figure 2 will show. This procedure was followed in developing welfare loss estimates by subclass, for each of the price variations in Table 3, and the results are contained in Table 4.

It should be noted that these estimates still depend on the demand functions that have been estimated and are assumed to hold. Even if the procedure described here captures well the loss in welfare -- according to the demand function -- from any prices that avoid a deficit, there may still be an error if the demand functions are incorrect. While it is possible for such errors to exist, the consistent estimates of these demand functions, with comparable results over time, indicates that they are probably reasonable.

C. Welfare Comparisons

1. Welfare Losses

Highlights of the welfare loss estimates in Table 4 are worth noting not only for differences by subclasses of mail between Ramsey and Postal Service prices, but also because they show consequences of modifying Ramsey prices in different degrees. The total welfare loss, in the first row of Table 4, increases every time more constraints force prices farther from their pure Ramsey levels, with the difference in welfare loss between pure and most constrained Ramsey prices amounting to $300 billion. Unconstrained Ramsey prices cause a total welfare loss of $1.866 billion, while the most constrained Ramsey prices impose a total welfare loss of $2.166 billion. As shown in the right most column of the first (Total) row of Table 4, the prices proposed by Postal Service (in the right most column of Table 3) impose a welfare loss of $3.159 billion, or about $1 billion more than constrained Ramsey prices.

Table 4. Welfare Losses ($millions)

Mail Subclass	Pure Ramsey	Ramsey PFD	Ramsey IC+PFD	Ramsey IC +PFD+TH	TY98 AR Proposed
Total	1865.756	1976.315	2094.094	2165.660	3158.615
Letters	998.161	1129.800	1116.559	1311.796	1288.456
Cards	21.160	23.306	23.098	26.136	135.732
Priority	32.099	35.074	34.784	39.382	557.354
Express	8.415	9.179	152.483*	153.224	299.634
PerInCo	0.858	12.740*	12.513	4.370	0.016
PerNP	12.681	26.236*	25.734	8.448	0.038
PerClssrm	0.041	2.524*	2.485	0.984	0.308
PerReg	189.031	226.696	222.734	80.343*	0.508
StdA Reg	315.378	354.501	350.644	415.040	173.835
StdA ECR	31.378	34.317	34.029	38.629	660.354
StdA NP	157.655	8.032*	7.936	9.529	2.372
StdA NPECR	24.204	0.107*	0.106	0.121	2.503
StdB Parcel	9.422	10.319	10.233	11.637	0.075
StdB BPM	7.586	8.387	8.308	9.586	12.725
StdB Spl	5.118	5.646	5.594	6.434	5.265
StdB Lib	0.418	0.473*	0.468	0.542	0.064
Registry	1.352	1.487	4.743*	4.743	5.139
Insurance	32.912	67.292	61.677	1.647*	0.914
Certified	10.623	11.805	11.688	13.594	5.205
COD	1.027	1.177	1.162	1.062*	0.005
Money Order	6.661	7.707	7.600	3.311	8.112

Beginning with First Class Mail categories and Express Mail, departures from pure Ramsey prices clearly raise the welfare loss burden when the RFRA markups are applied in the second column. Welfare losses increase in First Class and Express Mail by almost $140 million as a result of the Act, with most of that added loss ($130 million) in First Class letters. Then adding the requirement of meeting incremental cost in the third column raises prices in Express Mail (and in Registry), where it causes welfare losses to jump from $9 million to $152 million (and in Registry from $1.5 million to $4.7 million), but lowers prices and losses modestly elsewhere. The welfare loss in First Class Mail goes down nearly $14 million, as the loss increases in Express Mail by $143 million. The judgmental reductions of "high" markups in the fourth column reduce welfare losses in three subclasses that benefit, Periodicals Regular, Insurance, and COD, but raise them elsewhere. For instance, to replace revenue lost by the judgmental reductions from Ramsey markups in these three subclasses, the welfare loss in First Class letters increases from $1,116.559 million to $1,311.796 million, or an increase of almost $200 million dollars.

Welfare losses for the group comprising First Class Mail and Express Mail are substantially greater under the Postal Service proposal than under the most modified Ramsey prices, for which welfare losses are presented in the fourth column of Table 4. In that comparison, the Postal Service prices impose an added welfare loss of $725 million on First Class and Express Mail together, with a slightly lower loss in letters but

a greater loss of about $110 million in cards, $490 million in Priority Mail and $145 million in Express Mail.

In the Periodicals Class, the move from pure Ramsey prices to prices that are prescribed by the RFRA actually raises prices for the three preferred classes. The reason is that the Revenue Forgone Act reduces other preferred prices -- and their contributions -- so much that remaining prices must go up. One of those prices that must be raised is Periodicals Regular, which is the basis for markups in the preferred periodicals subclasses. Periodicals Regular has an own-price elasticity of demand of only -0.143, so its pure Ramsey markup is high. And when markups must increase, to replace the contribution lost from other preferred classes, the Ramsey markup on Periodicals Regular rises from 3.02 to 3.30. The preferred Periodicals subclasses have high demand elasticities and thus low Ramsey markups, so their pure Ramsey prices are low. But when their markups are tied as they are by the Revenue Forgone Act to Periodicals Regular, which has a high markup (made even higher by effects of the Act) those preferred Periodicals markups -- and thus prices -- are higher.

Prices proposed by the Postal Service for the Periodicals class are considerably lower than any version of Ramsey prices, so welfare losses from the proposed Postal Service prices are much lower for the Periodicals class. The proposed rate for Periodicals Classroom is even lower than estimated test-year, after-rates cost. If those costs are correct (Witness Kaneer in USPS-T-35 suggests they may not be), there is a welfare loss from having the price below marginal cost. At the same time, there is a

negative contribution to other costs, so welfare losses will have to be greater in other subclasses to make up for that lost contribution.

In Standard A Class, the RFRA reduces nonprofit prices markedly and thus reduces welfare losses from the pure Ramsey levels. The nonprofit rates proposed by the Postal Service reflect the Act and they yield low welfare losses. The rates proposed by Postal Service for Standard A Enhanced Carrier Route are almost twice as high as Ramsey prices for that subclass, however, while the rates proposed for Standard A Regular are somewhat lower. Overall, the welfare loss for the class is substantially greater under the Postal Service proposal than under Ramsey prices. Under the most constrained Ramsey prices in the fourth column, the welfare loss would be about $380 million lower than under Postal Service proposals.

Welfare losses from Postal Service proposals are quite low for all services of the Standard B Class, being highest in Bound Printed Matter. They are far lower under Standard B Parcels rates proposed by the Postal Service than under any of the Ramsey price versions for that service. There is hardly any difference between the Standard B Library rates under Ramsey pricing or under the RFRA requirements. Because the Postal Service's proposed Standard B Special rates are lower, the proposed Library rates are also lower, and welfare losses accordingly are smaller. In Special Services, the incremental cost test forces a substantial increase in the Registry price in order to avoid cross subsidy. And the extremely low elasticity of -0.105 for the Insurance subclass causes a very high Ramsey price markup, which is reduced by

Witness Bernstein's markup limitation. As a result, the constrained Ramsey price is much lower in column (4) of Table 3 than in column (3), and welfare loss falls to less than one-tenth of what it was without that limitation. But even after being judgmentally limited in this way, the Ramsey price is still higher than the Postal Service proposal, so welfare loss is lower in the Postal Service proposal.

2. Welfare Loss Per Unit of Contribution

This examination of prices by subclass reveals the same broad effects by major mail classes that were noted in Part A. It also shows how variations in Ramsey prices affect the losses in welfare, and how they are distributed across the subclasses of mail. Ramsey prices, with various degrees of modification, have traded off the welfare loss from raising price above marginal cost against the gain achieved in raising contributions to cover other costs. Table 5 presents the contributions made under all pricing arrangements by the individual subclasses of mail. And Table 6 shows average welfare loss per dollar of contribution for the same pricing arrangements and subclasses.

Notice first that total contribution in the first row of Table 5 is the same for every alternative set of prices. The amount contributed by proposed Postal Service rates, when long-run elasticities were used to forecast volumes, was taken as the benchmark level of contribution, and all other prices were set to raise the same contribution. The Postal Service proposes to raise slightly less revenue from letters than constrained Ramsey prices would yield, but substantially more from cards, Priority Mail and Express Mail. Much less revenue is raised from Periodicals Mail by the Postal Service, $1.5

billion less in Periodicals Regular alone. But more is raised from Standard A Mail. Less revenue is raised from Standard A Regular than constrained Ramsey prices would call for, but much more is raised from Standard A Enhanced Carrier Route. Having rates for one subclass higher than Ramsey prices and for another subclass lower in this way will tend to produce more welfare loss overall. The Postal Service also raises less contribution from Standard B Mail than constrained Ramsey prices would. Only about one tenth of the contribution of constrained Ramsey prices is derived from Parcel Post under proposed Postal Service rates. The Postal Service raises more money from Bound Printed matter than constrained Ramsey prices do, but less from the other two Standard B subclasses.

Table 5. Contributions ($millions)

Mail Subclass	Pure Ramsey	Ramsey PFD	Ramsey IC+PFD	Ramsey IC +PFD+TH	TY98 AR Proposed
Total	25816.420	25816.420	25816.420	25816.420	25816.420
Letters	14627.070	15688.880	15584.270	17083.730	16885.940
Cards	206.978	217.368	216.379	230.408	485.438
Priority	526.590	549.971	547.723	578.781	2000.351
Express	94.267	98.273	298.034*	299.330	419.496
PerInCo	16.177	62.440*	61.874	70.317	2.231
PerNP	214.397	323.252*	319.668	374.470	10.576
PerClssrm	0.799	4.652*	4.630	4.931	-2.529
PerReg	2743.787	3083.924	3048.882	1621.242*	107.886
StdA Reg	3211.185	3423.289	3402.805	3698.316	2363.994
StdA ECR	596.643	623.659	621.061	657.011	2664.452
StdA NP	2224.124	389.264*	386.755	422.573	204.154
StdA NPECR	341.460	16.648*	16.572	17.630	87.995
StdB Parcel	104.385	109.132	108.684	115.005	11.007
StdB BPM	136.793	144.138	143.426	153.380	179.365
StdB Spl	93.150	98.000	97.530	104.079	94.527
StdB Lib	7.969	8.470*	8.429	8.994	3.155
Registry	24.956	26.197	47.547*	47.547	49.571
Insurance	363.736	648.539	603.614	45.892*	32.431
Certified	187.395	198.227	197.173	211.985	128.721
COD	16.384	17.750	17.614	16.706*	1.021
Money Ord	78.177	84.350	83.738	54.092	86.642

Table 6. Average Welfare Loss per Dollar of Contribution

Mail Subclass	Pure Ramsey	Ramsey PFD	Ramsey IC+PFD	Ramsey IC +PFD+TH	TY98 AR Proposed
All	0.072	0.077	0.081	0.084	0.122
Letters	0.068	0.072	0.072	0.077	0.076
Cards	0.102	0.107	0.107	0.113	0.280
Priority	0.067	0.070	0.069	0.073	0.267
Express	0.089	0.093	0.512*	0.512	0.714
PerInCo	0.053	0.204*	0.202	0.229	0.007
PerNP	0.059	0.081*	0.081	0.090	0.004
PerClssrm	0.051	0.542*	0.537	0.623	-0.122
PerReg	0.069	0.074	0.073	0.050*	0.005
StdA Reg	0.098	0.104	0.103	0.110	0.074
StdA ECR	0.053	0.055	0.055	0.058	0.248
StdA NP	0.071	0.021*	0.021	0.022	0.012
StdA NPECR	0.071	0.006*	0.006	0.007	0.028
StdB Parcel	0.090	0.095	0.094	0.100	0.007
StdB BPM	0.055	0.058	0.058	0.062	0.071
StdB Spl	0.055	0.058	0.057	0.061	0.056
StdB Lib	0.052	0.056*	0.056	0.059	0.020
Registry	0.054	0.057	0.100*	0.100	0.103
Insurance	0.090	0.104	0.102	0.036*	0.028
Certified	0.057	0.060	0.059	0.063	0.040
COD	0.063	0.066	0.066	0.064*	0.005
Money Ord	0.085	0.091	0.091	0.060	0.094

Raising revenue in the form of contribution to cover other, largely fixed, costs is necessary, as we have noted, but it is desirable to keep the welfare loss that follows from raising such funds as low as possible. To examine how effectively the contribution is being raised we can look at welfare loss per unit of contribution for every subclass of mail and for all subclasses together (total welfare loss against total contribution). Ratios of welfare loss per dollar of contribution are presented in Table 6. On an overall basis, shown in the first row of Table 6, unconstrained Ramsey prices impose a cost of about 7 cents per dollar of contribution, whereas the most constrained Ramsey prices impose a cost of roughly 8 cents per dollar of contribution. For comparison, the Postal Service proposal imposes a cost of about 12 cents per dollar of contribution raised.

Unconstrained Ramsey prices have roughly equal values for welfare loss per dollar of contribution across the subclasses of mail. Complying with the RFRA raises welfare loss per contribution dollar markedly in preferred Periodicals subclasses (marked by asterisks in the second column). Indeed, the welfare loss per dollar of contribution in Periodicals Classroom rises ten fold when the Act is applied to Ramsey prices, which already favor preferred Periodicals subclasses because of their high (in absolute value) demand elasticities. The Standard A ratio of welfare loss per dollar of contribution falls substantially in the two Nonprofit subclasses, which have their rates lowered by the RFRA. When Ramsey prices for Express Mail and Registry are set equal to incremental cost in the third column, the welfare loss per dollar of contribution for each of those subclasses rises dramatically. This is especially true for Express Mail

where the ratio reaches 0.512. Because more contribution results from these price increases, the burdens on other classes ease, and so the ratios for other classes of mail fall slightly. Imposing an arbitrary upper limit on Ramsey markups in the fourth column limits the welfare losses in the three affected subclasses, Periodicals Regular, Insurance, and COD. But to make up for the contribution that is consequently lost, welfare-loss-to-contribution ratios have to increase in most other classes.

Despite the variations introduced by constraints on Ramsey prices, the welfare loss ratios for the most constrained Ramsey prices are more similar than those for the Postal Service's rate proposal. The loss per dollar of contribution under Postal Service rates is very high for cards, Priority Mail and Express Mail (where it reaches 0.714), and very low for Periodical Mail subclasses. The loss per dollar is again high for Standard A Enhanced Carrier Route (0.248) and then very low for Standard B Parcel Post (0.007). These variations in welfare loss per dollar of contribution across subclasses of mail lead to greater overall welfare loss. High prices are accompanied by bigger welfare losses than low prices can save when they are low, in part because welfare losses rise roughly with the square of the difference between price and marginal cost (see equation (3) above). So a side effect of great variations in welfare loss per dollar of contribution raised is that the total welfare losses become larger. That result is evident in the Postal Service's loss of 12 cents per dollar of contribution raised, compared to 8 cents per dollar under constrained Ramsey prices.

D. Worksharing Discounts

The worksharing discount allows others (in this case, customers) to carry out some of the tasks that are part of a postal service, and, in return, to receive the service for a lower price. The discounts are comparable to "access" charges that allow one supplier of a service to use the resources of another supplier, as when a long distance carrier uses a local telephone network or one railroad uses another railroad's tracks. The practical and appealing "efficient components pricing" (ECP) principle of access pricing calls for the resource owner to be compensated for its own cost, including opportunity cost, when granting access to others. Lost profit would be counted as part of opportunity cost. Allowing an access price consistent with this principle has the advantage of motivating the resource owner to allow access. It will also invite low cost suppliers to participate in supplying the service. The result can be ideal, even when the resource owner is a monopoly, although regulation of the final service price may then be in order.

The ECP idea assumes that volume shifts will be made abruptly. All suppliers of worksharing effort can afford to serve at the same access price, for instance, and when that price is reached they will all participate. When cross elasticities are not infinitely elastic at the crucial access price in this way, then the cross elasticities should be taken into account in setting optimal prices. And a ready-made means of doing so exists in Ramsey prices. The Postal Service examines this possibility by treating worksharing as

another service, and Ramsey principles are applied in choosing prices to maximize welfare as in other multi-service optimal pricing situations.

1. Ramsey Pricing for Single-Piece and Worksharing Letters

The most significant example of worksharing occurs in First Class letters, which can be divided into single-piece letters and worksharing letters. Application of Ramsey pricing to these mail categories was studied by Witness Bernstein (USPS-T-31). Several problems complicate the estimation of Ramsey prices using information presently available. The first problem is caused by the wide range of mail pieces in the two mail streams, which complicates cost estimation for single-piece and worksharing letters. Another problem arises in the use of demand elasticity and cross elasticity information for the calculation of Ramsey prices.

Having a mixture of mail in a particular category complicates the separate analysis of single-piece and workshare portions of First Class Mail. One consequence is that costs, and also prices, of these two letter-mail categories differ because their contents differ. That is, in addition to worksharing, there are other differences in the costs of these two mail categories (the mixtures of mail in the two categories differ: e.g., relatively more pieces of single-piece mail weigh two-ounces or more). As a result, the worksharing discount does not equal the difference between single-piece and worksharing prices. Moreover, it is not easy to predict the cost of the mail that moves, say, from single-piece to worksharing when the discount increases.

The Postal Service has initially tackled the difficult problem of finding Ramsey prices by treating single-piece and worksharing letters as two services. In estimating demands for these two services, own-price elasticities were estimated, plus elasticities of each service with respect to the workshare discount. These discount elasticities were not included in the Ramsey pricing formulas (USPS-T-31, p. 83), but were included in the volume forecasting formulas. In responding to POIR-3-1, Witness Bernstein said the cross elasticities are not needed in the pricing formulas, essentially because equal (except for sign) derivatives with respect to the discount are assumed for both letter categories (condition (6) below). Those equal derivatives might prevent any effect on relative prices if both services had the same elasticity and thus the same markup.

But equal derivatives will not ensure the same elasticity or markup, and if differing markups produce differing contributions per unit, one service might be favored when shifting volumes between the services is possible. The ease of shifting, or the strength of elasticity responses, might then matter. More importantly, if optimal pricing equations are derived directly from a welfare maximizing problem involving the two services, the cross-price effects will clearly appear in the resulting Ramsey-price equations, just as they do in Witness Bernstein's formula for Ramsey prices (USPS-T-31, p. 17). With cross effects omitted from the Ramsey pricing formulas, relative prices cannot reflect them, and the resulting price structure will not reliably be correct.

Estimation by the Postal Service of separate demands for single-piece and worksharing letters assumed that the letters moved from one letter category to the other

in response to a change in the workshare discount (USPS-T-7, p. 20). This assumption of equal (but opposite sign) derivatives with respect to the discount is somewhat like the assumption of equal cross derivatives underlying the Slutzky-Schultz condition (USPS-T-7, p. 143). The assumption simplifies the relationship between discount elasticities for single-piece and worksharing letters. And it allows estimation of the elasticity of single-piece letters with respect to the discount by using the results from estimating the elasticity of worksharing letters with respect to the discount. The cross elasticities implied by these estimated discount elasticities are very large, however, as the next two subsections will show. When included in the pricing formula, large cross elasticities can prevent the calculation of Ramsey prices, because they can upset an equilibrium. When own-price elasticities dominate, they support equilibrium tendencies; when a service price goes up, the volume of that service will fall, and vice versa. Cross elasticities lack this stabilizing property of own-price elasticities, because they simply intrude into other markets. When they are large they can overwhelm the own-price effects and prevent an equilibrium, which, in turn, can prevent the calculation of Ramsey prices.

2. The Relationship between Discount Elasticities and Cross Elasticities

It is possible to relate the discount elasticities to more standard cross elasticities. First, let us represent the discount as $d = p_s - p_w$, where p_s is the price of single-piece letters and p_w is the price of worksharing letters. As noted above, the discount does not

exactly equal this difference in prices. But if a constant, c, can be subtracted from the difference, d, to capture the effects of different mixtures of letters, as proposed, then $d = p_s - p_w - c$, and the results will be unaffected. This latter definition will be used in what follows. Elasticities of single-piece and worksharing letters are

(4)

$$\beta_s = \frac{\partial V_s}{\partial d}\frac{d}{V_s}$$

and (5)

$$\beta_w = \frac{\partial V_w}{\partial d}\frac{d}{V_w}$$

where V_s is single-piece volume and V_w is worksharing volume. Witness Thress (USPS-T-7, p.20) assumed that the discount shifts mail from one letter category to the other, or that

(6)

$$\frac{\partial V_s}{\partial d} = -\frac{\partial V_w}{\partial d}.$$

Using this condition with the elasticity equations above implies that

(7)

$$\beta_s = -\beta_w \frac{V_w}{V_s},$$

which allows estimation of the single-price elasticity from the worksharing elasticity plus information about volumes.

Now consider the form of ordinary cross elasticities. (Recall that *s* identifies single price letters and *w* denotes worksharing.) The cross elasticity of single-price letters with respect to the worksharing price, E_{sw}, is

(8)

$$E_{sw} = \frac{\partial V_s}{\partial p_w} \frac{p_w}{V_s}.$$

We can interpret this cross elasticity and relate it to the discount elasticity above in (4), the elasticity of single-price letters with respect to the discount. First, (8) can be expressed as

$$E_{sw} = \frac{\partial V_s}{\partial p_w} \frac{p_w}{V_s} = -\frac{\partial V_s}{\partial d} \frac{(p_s - p_w - c)}{V_s} \frac{p_w}{(p_s - p_w - c)},$$

because

$$\frac{\partial V_s}{\partial p_w} = \frac{\partial V_s}{\partial d}\frac{\partial d}{\partial p_w}$$

and $$\partial d / \partial p_w = \partial(p_s - p_w - c)/\partial p_w = -1.$$

By recognizing (4) and substituting it into E_{sw}, we have

(9)

$$E_{sw} = -\beta_s \frac{p_w}{(p_s - p_w - c)}.$$

Thus, the cross elasticity of single piece letters in response to the price of worksharing letters equals minus the elasticity of single piece letters with respect to the discount, multiplied by the price of worksharing letters divided by the discount.

The cross elasticity effect of the price of single-piece letter mail on the volume of worksharing letter mail can be defined similarly as

(10)

$$E_{ws} = \frac{\partial V_w}{\partial p_s}\frac{p_s}{V_w}.$$

By following the same steps for this case, and using equation (5) above, it is possible to obtain

(11)

$$E_{ws} = \beta_w \frac{p_s}{(p_s - p_w - c)}.$$

The cross elasticity equals the discount elasticity multiplied by the price of single piece letters divided by the discount.

3. Implied Cross Elasticities of Demand are Large

It can now be shown that for available discount elasticity estimates, the relations in (9) and (11) would imply cross elasticities of demand that are large (in absolute value). Ignoring signs and focusing on size, the cross elasticities will be substantially larger than their respective discount elasticities, and will even be larger than their own-price elasticities of demand. Each cross elasticity equals a discount elasticity times either $-p_w/(p_s - p_w - c)$ or $p_s/(p_s - p_w - c)$, both of which can be expected to be larger than one in absolute value. For example, Witness Bernstein found single piece and worksharing Ramsey prices of $.450 and $.242, and a Ramsey discount of $.144 (USPS-T-31, p. 87), yielding price-to-discount ratios of about 3.1 for $p_s/(p_s - p_w - c)$ and -1.7 for $-p_w/(p_s - p_w - c)$. The discount elasticities themselves are already sizable, with

the single piece discount elasticity at -0.164 and the worksharing discount elasticity at 0.222 (USPS-T-7, pp. 40, 41). Indeed, ignoring their signs, estimates of the discount elasticities are comparable in magnitude to own-price elasticities of demand, which are -0.189 for single piece letters (versus the -0.164 discount elasticity) and -0.289 for worksharing letters (versus the 0.222 discount elasticity). Multiplying discount elasticities by values for the price-to-discount ratios will imply crosselasticities of demand in (9) and (11) that are larger (in absolute value) than own-price elasticities of demand:

(9)

E_{sw} = (- 0.164)(-1.7) = 0.279, versus own price elasticity of E_{ss} = - 0.189

(11)

E_{ws} = (0.222)(3.1) = 0.688, versus own-price elasticity of E_{ww} = - 0.289

In such circumstances it is awkward, and possibly even unstable, to have cross elasticities exceed own-price elasticities (in absolute value). For the volume of one service can then depend more on the price of another service than on its own price. This means that one service could lower its price but if the price of the second service was also lowered the first service actually could lose volume. And the same would hold true for the second service. Normal price adjustments could then have perverse, meaning unstable, consequences, with price reductions bringing quantity reductions and vice versa. A process that depends on convergence of prices to an equilibrium, such as the method used to calculate Ramsey prices, might not then yield a solution.

The cross elasticities implied by estimated discount elasticities thus are so great they can bring instability or deny the possibility of an equilibrium, which is a condition we do not see in the world. So it is likely that the estimated discount elasticities are too large to be plausible. After showing that either discount elasticity could be estimated from the other, Witness Thress said the worksharing elasticity with respect to the discount was used "...because the worksharing discount, as expected, had a larger and more significant impact on worksharing letters than on single-piece letters" (USPS-T-7, p. 20). Since the larger estimated value was selected as the basis for both elasticities, they both could easily have been overestimated. It may not be possible to calculate Ramsey prices with such large estimates of discount elasticities when those elasticities are properly reflected in the Ramsey price equations.

4. Formulating the Ramsey Pricing Problem

The Ramsey pricing problem for worksharing might be formulated in different ways. One possible way has been discussed so far, to consider single-piece letters and worksharing letters as two services. In that case, with nonzero cross elasticities, those cross elasticities should be reflected in the Ramsey-pricing formula. Otherwise, the interdependence of the prices will not be reflected in the structure of prices. This omission may not be important in the present effort of the Postal Service, where finding Ramsey prices is limited to an illustrative role. Various ad hoc costing assumptions are needed, for different possible volume shifts, and these assumptions are difficult to

implement. And there may be a problem with convergence of the Ramsey price calculations, because of the large cross elasticity terms.

An alternative formulation would focus on the single-piece letter price as determinant of the total volume of letter mail. The discount from that price for worksharing would invite some fraction of that letter mail volume to become worksharing letters. The relevant discount elasticity would then be a supply elasticity, a willingness of mailers to provide worksharing effort in response to changes in the discount. The worksharing discount elasticity estimated by Witness Thress (USPS-T-7) might even be interpreted as an estimate of this supply elasticity, although its value might be affected by concurrent estimation of other influences that would not be relevant in this model. With this formulation, there would be no need for a single-piece letters discount elasticity. Nor would there be any role for an own-price elasticity of demand for worksharing letters.

Suppliers of worksharing would simply be seen as mailers making a profit-maximizing decision to workshare, based on the level of the discount. And their behavior would be reflected in the supply elasticity. There would be no separate demand for worksharing letters. Instead there would be a willingness to supply worksharing service, based on the level of the discount offered, for mail already decided on based on its price relative to alternative options. The volume of letters would depend on the price of letters and other factors, including the prices of other services that had nonzero cross elasticities with letters, but not on the level of the discount.

This formulation reflects the spirit of the Postal Service approach, in which the discount is assumed only to determine the division between workshared letter mail and nonworkshared letter mail. But the Postal Service creates more elasticities than can be managed in a consistent treatment of Ramsey prices. Genuine differences in the mail streams, and costs, of single-piece and worksharing letters encourage the modeling of separate demands, and the corresponding estimation of different elasticities. But by focusing on the demand for letter mail, together with the supply of worksharing, the problem can be formulated more simply and solved more effectively.

Further progress in developing Ramsey prices for single-piece and worksharing letters will benefit from better information about costs. Elasticity estimates are always difficult to obtain but are important. The effort should also be based on a carefully chosen formulation for access pricing according to Ramsey principles. Worksharing has become a significant factor in postal operations and that makes a Ramsey basis for pricing it a very desirable goal.

III. THE COST BASIS FOR PRICING

Estimation of volume variable cost, and of incremental cost, is undertaken by the Postal Service in this case. These cost concepts should afford a better representation of marginal cost for pricing purposes. Having them also should better equip the Postal Service to avoid cross subsidy across the various mail services. The conceptions invite some redesign of Postal Service accounting procedures, however, to produce estimates more reliably.

As emphasized by Postal Service Witness Panzer (USPS-T-11, p. 41), cost estimates should be based on a Postal Service operating plan, in order to yield consistent results. Of course this operating plan may not deal with questions that the estimation of incremental cost invites -- such as the actions that would be taken if First Class Mail was eliminated -- because the operating plan does not extend to such possibilities. While intelligent interpretation of the existing cost system may allow reasonable approximations of incremental costs, limitations of the system need also to be recognized. The cost system was not designed to produce incremental cost estimates, and more attention to this purpose is desirable.

Witness Takis's summary incremental cost estimates by broad classes of mail (USPS-T-41, Ex. USPS-41C) are presented in Table 7 below, along with estimates of volume variable costs and of contributions to other costs by mail class from Witness O'Hara's Direct Testimony (USPS-T-30, Ex. USPS-30B). Total contribution to other costs can be taken as an approximation to the relevant fixed or institutional cost,

because that is what the contribution is intended to cover. In large part, the difference between the total incremental cost and the total volume variable cost for a mail class often represents the fixed cost traceable to that class. In Table 7, that difference amounts to only about 11 percent of the total contribution to other costs, which approximates total fixed costs. And the difference is only about 9 percent of total volume variable costs. This suggests that the additional costs beyond volume variable costs, costs included in incremental costs, which are needed to supply all of the service, are relatively small.

Table 7. TEST YEAR 1998 AFTER-RATES VALUES

Mail Class	Volume Variable Cost(VVC) ($000s)	Incremental Cost (IC) ($000s)	Contribution to Other Costs ($000s)	IC minus VVC as percent of VVC	IC minus VVC as percent of Contribution
First	17,439,087	19,067,294	17,264,660	9.34	9.43
Periodical	2,004,843	2,037,615	120,685	1.63	27.15
Standard A	8,311,021	8,769,081	5,567,869	5.51	8.23
Standard B	1,413,339	1,442,621	298,941	2.07	9.80
Priority/ Express	2,607,840	3,339,395	2,586.070	28.05	28.29
Total	31,776,129	34,656,006	25,838,225	9.06	11.15

Although at this point it is difficult to judge the reasonableness of these incremental cost estimates, one might expect that, in total, more than 11 percent of fixed costs could be traced to classes of mail. It is also surprising that incremental costs exceed volume variable costs only by about 2 percent in both Periodicals class

and Standard B class mail, indicating that fixed costs amount to only about 2 percent of the variable costs of those classes. If fourth class mail was terminated, for instance, any consequent savings in the costs of Bulk Mail Centers --which should be part of incremental cost -- would seem to amount to more than 2 percent of that mail's variable costs.

The incremental costs shown in Table 7 are estimated for the group of subclasses that make up the major classes of mail. The incremental costs that are traced to individual subclasses are slightly smaller. When added together, the TY1998 estimated incremental costs for subclasses in Exhibit USPS-T-41B add to $34,225,094,000, a total that is just 1.24 percent smaller than the total incremental cost of $34,656,006,000 in Table 7 based on estimates at the level of the mail classes. The largest difference between incremental cost for the class and for the sum of subclasses occurs in Standard A Mail. There, estimated TY1998 incremental costs for the group that makes up the class exceeds the sum of incremental costs for the subclasses by 2.8 percent. The incremental costs at the levels of the major classes of mail thus are not estimated to be much greater than the incremental costs of the subclasses. This assessment of incremental costs means that eliminating an entire class of mail would save little more than could gradually be saved by eliminating one subclass at a time.

In his testimony (USPS-T-41), Witness Takis gives little attention to the imputation of fixed costs when they are caused by more than one service. If a fixed cost is shared by, say, two services, an incremental cost for those two services together can be estimated. Then a test for cross subsidy can be carried out for that two-service

group, to determine whether the two services are being subsidized. Sometimes it is possible to trace the cost of a facility that is shared by more than one service to only one of the services. That possibility is shown in discussion of the Eagle Network (USPS-T-41, p. 12), which serves Express, Priority, and First-Class Mail, but can be imputed to Express Mail because it is deemed necessary only to that service.

Other shared costs would seem to deserve careful analysis and explanation. For example, Bulk Mail Centers process second, third, and fourth class mail. Are they regarded as necessary to one of those classes, as the Eagle Network is to Express Mail? If so, the appropriate cost should be counted as specific fixed cost, and thus be part of incremental cost, for that class. If not, are the Bulk Mail Centers necessary for two mail classes? For three? Answers to these questions determine the level at which cross-subsidy tests should be carried out. In some cases, incremental costs should be estimated for combinations of classes, and then tests for cross subsidy should be conducted for that combination of classes. The present effort seems essentially to focus on incremental cost estimates for only one class at a time. It is possible that when fixed costs that are shared by services are imputed to those services, a larger portion of total costs would be identified as incremental, and more incremental cost tests could then be carried out.

A puzzle arises in several special services (certified, insurance, C.O.D., special handling) and in mailgrams, subclasses for which incremental costs are lower than volume variable costs. While such a result is clearly possible, it implies that marginal cost is increasing with the volumes of those services. The implication is that such

services could be offered at lower cost by smaller providers. Except for mailgrams, however, the services are offered jointly with other postal services, so separate provision may not be feasible.

IV. PREPAID REPLY MAIL AND QUALIFIED BUSINESS REPLY MAIL

That the Postal Service will allow a rate concession for prebarcoded reply mail is a development to be welcomed. Proposals that would lower the price for this very clean, low cost mail have been made repeatedly in the last decade, and a price break should encourage its use and thereby increase its benefits. The proposed treatment is not a general one that offers the price break to the appropriate decisionmaker, however, apparently because the Postal Service fears that having two stamp prices would burden and confuse the general public, and would bring administrative and enforcement problems for the Postal Service. So the proposal grants a 3 cent discount for qualifying prebarcoded reply mail, but has recipients of reply mail pay for it at the discounted rate rather than those who deposit it in the mail.

Two versions of reply mail are proposed, Prepaid Reply Mail (PRM) and Qualified Business Reply Mail (QBRM). PRM would require the envelope or card provider to prepay the reply mail, based on mailings and an audited average percentage of envelopes or cards returned. The mailer would pay $100 annually to maintain an account and $1,000 monthly to cover Postal Service auditing and administrative costs, in addition to discounted rates of 30 cents per letter and 18 cents per card returned. QBRM would be offered at the same rates per mail piece as PRM, but the additional fees would differ. QBRM would have postage-due calculations performed by the Postal Service. The mailer would maintain an advance deposit account, which would be debited based on actual QBRM usage. For carrying out this

postage-due calculation, the Postal Service would charge 6 cents per piece. Thus the Postal Service fees for managing the reply mail transactions are $1,000 per month for PRM (plus $100 per year) and 6 cents per piece for QBRM.

These PRM and QBRM proposals have a serious disadvantage: they make mailing a reply card or letter seem free to the customer. As a result, some customers may choose reply mail even though they would not do so if they faced its full cost, which means the final outcome can be inefficient. It can be inefficient in that some customers who would choose to pay bills by other means, such as stopping at an office on their way to work at a cost they might see as worth 5 or 10 cents, may now pay by mail simply because it seems free to them. And yet the actual cost is greater than their alternative means of payment would be, which means the outcome is not optimal for society.

Witness Fronk even suggests (USPS-T-32, p. 38) that an aim of the proposal is to increase mail use by customers who now walk in payments rather than use the mail. While this response of consumers to apparently free reply mail would increase mail volumes, and the resulting contribution to postal profit, it would accomplish that result by misleading customers. Customers are misled when reply-mail service is made to seem free. If they have to pay for the service themselves, some of these customers who now walk in their payments will probably continue to walk them in, even with the reply mail price at 30 cents, because they find that is a less costly way to pay than using the mails. Or they may shift to electronic means, which may actually have lower social cost.

If the original mailer who is the recipient of reply mail wishes to pay for it, perhaps that choice should be made available. The recipient may greatly prefer to have the mail used by customers making payments for some reason, for example, and be willing to pay extra to achieve that result. But it is also desirable to have mailers of the reply cards pay for mailing them, in order to have efficient choices made. Developing ways for the Postal Service to discriminate between mailings of differing stamp value at low cost thus is clearly desirable.

Many important pricing distinctions, such as a reduction in price for local mail, can be implemented once stamp values can be easily recognized. At present, administrative means of identifying usage of the reply mail, as proposed in this case for PRM and QBRM, impose very large administrative and transaction costs. In the case of QBRM, for example, the proposed 6 cents per piece charge to identify the mail that is to be discounted will cost twice as much as the 3 cent discount per piece that is to be granted. In the case of PRM, the $1,000 monthly fee means that a mailer needs to save 3 cents--the discount per piece--on more than 33,333 pieces of mail per month in order to break even.

Low cost methods of distinguishing the stamp value on mail, such as a separate mail receptacle for local mail, have been proposed before. Of course these methods require that regular First Class mail be screened to ensure that a local mail stamp would not be used for non-local mail. Screening is a general problem that already exists, because there are stamps in use with a face value less than 32 cents and the Postal Service must ensure they are not used to obtain a 32 cent service. It would

appear that such screening is feasible because it already occurs. Allowing reply mailers to decide for themselves whether to mail a courtesy reply envelope at a reduced rate would also appear to be feasible, and its efficiency benefits are clearly desirable.

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